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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/033,873	12/20/2001	Kazuo Aita	S004-4507	1287

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EXAMINER

CULBERT, ROBERTS P

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 12/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/033,873

Applicant(s)

AITA, KAZUO

Examiner

Roberts Culbert

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 March 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 December 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☒ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Priority

Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Japan on 12/21/2000. It is noted, however, that applicant has not filed a certified copy of the Japanese application as required by 35 U.S.C. 119(b).

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the method steps of injecting/irradiating gallium ions, performing dry etching, and removing impregnated portions by dissolving, as recited in claims 1 and 5, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Figure 3 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

Claim 5 is objected to because of the following informalities: Claim 5, Line 3 contains illegible character spacing between words. Appropriate correction is required.

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Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claims 2, 4, 5, and 7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding Claim 5, it is not clear if the claimed step of "irradiating gallium ions into a region of a glass substrate to be processed using a focused ion beam apparatus" is intended to be the same step as the claimed step of "performing ion injection". It is further unclear if the step of "performing dry etching" is intended to be a result of the ion injection as stated by applicant on page 7, Lines 11-12, or a separate etching step.

Note that for the purpose of examination it is assumed that the steps of "irradiating gallium ions into a region of a glass substrate to be processed using a focused ion beam apparatus" and the step of "performing ion injection" are considered to be the same step as described in the specification, and the step of "performing dry etching" is considered a result of the step of "performing ion injection" as described in the specification.

Regarding Claim 2, it is not clear if "substrate erosion time" refers to the step of injecting ions and the resulting etching that occurs (see above), or the step of dissolving in solution.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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Claims 1 and 5 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,096,459 to Yang.

Referring to Figures 1-5 and the related description, Yang teaches a method of processing a glass substrate comprising the steps of injecting gallium ions into a region of a glass substrate (Col. 3, Lines 16-18 and 34-41) to be processed using a focused ion beam apparatus (Col. 3, Line 50-51 and 60-64); and soaking the glass substrate in an alkaline solution so that portions impregnated with gallium ions are removed by dissolving in a localized manner (Col. 3 Lines 65-67). See also (Col. 2, Lines 33-44) for a summary of the invention of Yang.

Regarding claim 5, Yang also teaches a method of processing a glass substrate comprising the steps of: irradiating gallium ions into a region of a glass substrate to be processed using a focused ion beam apparatus (Col. 3, Lines 34-41), performing dry etching (sputtering) and performing ion injection (Col. 3, Lines 49-64); and soaking the glass substrate in an alkaline solution so that portions impregnated with gallium ions are removed by dissolving in a localized manner (Col. 3 Lines 65-67). Note that the step of performing dry etching is inherent in the teaching of Yang, as Yang teaches that the ion implantation is performed using sputtering at the same energy as applicant, and the etching is an inherent result of the sputtering as stated by applicant on Page 7, Lines 11-12: "*sputtering etching is carried out by necessity in the ion beam radiation*".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 6 and 7 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over U.S. Patent 6,096,459 to Yang.

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As applied above, Yang teaches the method of the invention substantially as claimed, but does not teach the glass substrate is a Levenson mask substrate, and the portion to be processed is a half-wavelength-deep defect remaining after digging of a trench.

Since the substrate in the claimed invention is made from the same material as the Levenson mask substrate of the claimed invention (silica glass), it may be defined as a Levenson mask substrate.

Further, since Yang teaches that the method is suitable for a phase shifting lithography (Col. 1, Line 38 – Col. 2, Line 10) and (Col. 3, Lines 62-64), it would have been obvious to one of ordinary skill in the art at the time of invention to use the method of Yang to process a Levenson mask substrate where the portion to be processed is a half-wavelength-deep defect remaining after digging of a trench. Note that although Yang does not explicitly state “Levenson mask” a “Levenson mask is inherently described with the same materials as applicant (chrome on silica glass) in a “phase shift mask”. One of ordinary skill in the art would recognize that the description of Yang applies to a Levenson mask, as it is well known that a Levenson mask is a phase shift mask. See Background section of instant application.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,096,459 to Yang.

Yang teaches that the energy of the focused ion beam may be changed depending upon the thickness of the defect (Col. 3, Lines 54-56 and 62-64). It would have been obvious to one of ordinary skill in the art at the time of invention to regulate processing depth by changing the focused ion beam energy depending on the depth of the defect as taught by Yang.

Note that regulating the depth of the processing by changing the substrate erosion time is well known in the art of etching.

Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,096,459 to Yang.

Official Notice is taken of the fact that it is notoriously old and well known in the etching art to regulate the etching rate of a solution by changing temperature or concentration of the solution. It would

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have been obvious to one of ordinary skill in the art at the time of invention to regulate the etching rate of a solution by changing temperature or concentration of the solution in the conventional manner.


Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (703) 305-7965. The examiner can normally be reached on Monday-Friday (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703) 308-1633. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

R. Culbert


GREGORY MILLS
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700